

ORRES CONTROL
OUTGOING TR NO

EG&G ROCKY FLATS

8806

EG&G ROCKY FLATS INC
ROCKY FLATS PLANT P O BOX 464 GOLDEN COLORADO 80402 0464 (303) 966 7000

December 2 1992

92 RF 13974

Robert M Nelson Jr
Manager
DOE, RFO

Attn R J Schassburger

OPERABLE UNIT 1 (OU 1) 881 HILLSIDE TREATABILITY STUDY SUMMARY
RLB 0744 92

Enclosed please find the subject OU 1 Treatability Study Summary The summary reviews the treatability study development and implementation process for OU 1 Results of the field and analytical work are presented as is the rationale for curtailing further treatability study work

If you have questions concerning this letter please contact D M Smith of Environmental Science & Engineering at 966 8636

R L Benedetti

R L Benedetti
Associate General Manager
Environmental Restoration Management

DMS cet

Orig and 1 cc R M Nelson Jr

Enclosure
As Stated

cc
S R Grace DOE RFO

ENJAMIN A
ERMAN, H S
RANCH, D B
ARNIVAL G J
OPP R D
AVIS J G
ARRERA D W
ANNI B J
ARMAN, L K
EALY, T J
ILBIG, J G
DEKER, H
PSH, J M
BRY, W A
JESTER, A W
E, T M
IANN, H P
ARX, G
DONALD, M M
KENNA, F G
CNTRO, E J K
ORGAN, R V
OTTER, G L
ZZUTO, V M
LEY, J H
ANDLIN, N B
HEPI, R R
T WART, D L
JLLIVAN, M
WANSON, B
ILKINSON, R B
ILSON, J M
ANE, J O
DPT, F R L
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RLB cet

ADMIN RECORD

4 0111-001010

Preface

The intent of this attachment is to provide a summary of events completed to support a phased approach to treatability studies for the 881 Hillside (Operable Unit 1 [OU1]) Corrective Measures Study/Feasibility Study (CMS/FS). To this end, the following sections provide pertinent information with regard to 1) the scoping of treatability studies 2) the preparation of a treatability study work plan (TSWP) and a field sampling plan (FSP) 3) the implementation of field sampling and 4) the implementation of an analytical program to fully characterize untreated soil samples.

Scoping of Treatability Studies

Initial efforts associated with the OU1 CMS/FS focused on evaluating whether treatability studies could be useful in support of potential future remedial alternatives. A review of existing site characterization data (Phase I and Phase II Remedial Investigation data) in March 1992 indicated that groundwater and possibly subsurface soil are contaminated with volatile organic compounds (VOCs) with the former medium exhibiting the most significant concentrations e.g. up to 33,000 µg/l (33 ppm) for the VOC 1,1-dichloroethene. Table 1 provides a summary of contaminant concentrations found at OU1 Individual Hazardous Substance Sites (IHSSs). In addition, Table 1 lists technologies considered potentially applicable for treatment of the site contaminants. Within OU1, elevated groundwater concentrations of VOCs were found in samples obtained from wells 0587, 1074 and 4387 which are located at IHSS 119.1 (see Figure 1).

Based on the review of OU1 Phase I and II characterization data, the treatability program for OU1 was focused toward the evaluation of in situ treatment technologies for the removal and/or destruction of VOC contamination in saturated zone and possibly vadose zone subsurface soils (i.e. these soils had potential to be contaminated due to contact with groundwater). Treatability studies for the treatment of groundwater contaminated with VOCs were not necessary; there exists sufficient data for various technologies that have been

Rocky Flats Plant

OU 1

881 Hillside Data from Phase I and Phase II Investigations

Table 1

Initial Review of Potentially Applicable Treatment Technologies

IISS #	IISS Description	Borehole or Well Number	Affected Media	Preliminary Contaminants of Concern	Range of Contaminant Concentration	Approximate Extent of Contamination	Potentially Applicable Treatment Technologies
102	Oil Sludge Pit Site 40 x 70 area where approximately 30-50 drums of oily sludge were dumped in the 1950s. The sludge was from the lining of the two 6 foot oil tanks	BH0687 BH0687 B301590 B301590 B301490 BH0687 BH0687 5986 0877 0887 0887	Soil Soil Soil Soil Soil Soil Groundwater Groundwater Groundwater Groundwater	Mercy Cyanide 2-Butanone (MEK) Toluene Aromatic um-241 Cumene Trichloroethene Trichloroethene Trichloroethene	0.12-2.07 mg/kg 1.3 mg/kg 5 µg/kg 26-270 µg/g 0.63-1.4 pCi/g 0.4-0.6 pCi/g 6 µg/l 130 µg/l 20 µg/l 35 µg/l	Limited size IHSS Approximately 40 x 70 surface area No direct borings or wells inside IHSS	Soil data from perimeter of IHSS Higher organic concentrations are anticipated inside boundary of IHSS based on description of past use of site Potential Treatment Technologies Soil G Extraction w/ off gas treat Bioremediation Thermal Desorption Incineration
103	Chemical Burial Site Reported chemical waste disposal pit circa 1963 Approx 150 SE of bldg 881 Approx 50' diameter In alluvial material	P302790 P302890 BH0487 BH0487 BH0487 BH0487 BH0487 BH0487 BH0487 5487 5487 5487 5487	Soil Soil Soil Soil Soil Soil Soil Soil Groundwater Groundwater Groundwater Groundwater	Toluene Fluoranthene Phenanthrene Pyrene Anthracene Aromatic umy Oil and Grease Fled Ignitability Chloroform Trichloroethene Trichloroethene Trichloroethene	10-100 µg/kg 290 µg/kg 210 µg/kg 240 µg/kg 37 µg/kg 24 mg/kg 4.6 mg/kg NA 8 µg/l 4 µg/l 4 µg/l 2 µg/l	Limited size IHSS Contamination extends beyond boundary of IHSS No direct borings or wells inside IHSS	Higher organic concentrations are anticipated inside boundary of IHSS based on description of past use of site Potential Treatment Technologies Soil Gas Extraction w/ off gas treat Bioremediation Thermal Desorption Incineration
104	Liquid Dumping Site Reportedly a former pre-1969 liquid waste disposal pond however location is uncertain due to poor quality of 1965 aerial photo. Approx 50 x 50	P302590 490 390 NW II	Soil	Toluene	10-77 µg/g	No direct borings or wells inside IHSS	Not anticipated to find elevated organic concentrations inside boundary of IHSS Potential Treatment Technologies for Toluene Soil Gas Extraction w/ off gas treat

Rocky Flats Plant

OU 1

881 Hillside Data from Phase I and Phase II Investigations

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IHSS #	IHSS Description	Borehole or Well Number	Affected Media	Preliminary Contaminants of Concern	Range of Contaminant Concentration	Approximate Extent of Contamination	Potentially Applicable Treatment Technologies
105 1	Out-of-service Fuel Oil Tank Site Former storage tanks for No. 6 fuel oil. Tanks taken out of service 1976. Suspected leaks in 1972 but tanks tested tight. Tank closed in place.	No boring with 150 of tanks	No data	Unknown	Unknown	Unknown	No action as further Phase III RI monitoring indicates evidence of leakage from fuel tanks
105 2	Out-of-service Fuel Oil Tank Site Same 105 1	No boring or wells with 150 of tanks	No data	Unknown	Unknown	Unknown	No action as further Phase III RI monitoring indicates evidence of leakage from fuel tanks
106	Outfall Site IHSS consists of six inch diameter clay pipe located south of Bldg 881. Line with overflow line from the sanitary sewer sump in Bldg 887	0187 0187 6287 6287 5187 5187 5187 5187	Soil Soil Soils Soils Groundwater Groundwater Groundwater	Tetrahydroethene trans-1,2-dichloroethene Cyanide Oil & Grease Tetrachloroethene Toluene 2 Butanone (MEK) Total Xylenes	11 190 µg/kg 18 µg/kg 2 75 2 98 mg/kg 149-450 mg/kg 8 µg/l 9 µg/l 10 µg/l 2 µg/l	No direct borings or wells in vicinity of outfall	Potential Treatment Technologies if contamination is detected in outfall site are: Soil Gas Extraction w/oil gas treat Bioremediation Thermal Desorption Incineration Soil Flushing
107	Hillside Oil Leak Site Site of fuel oil spill from Bldg 881 footings drainage outfall includes ditches and oil drum pond. Spill occurred in 1972	B303090 190 290 BH0287 5487 5387 5487 5387 5387 5387	Soil Soil Groundwater Groundwater Groundwater Groundwater	Toluene 2 Butanone (MEK) Chloroform 1,1,1 Trichloroethane Trichloroethene 1,1 Dichloroethene Toluene	10-250 µg/g 75 µg/l 8 µg/l 2 18 µg/l 23 µg/l 21 µg/l 11 µg/l	No direct borings or wells in IHSS No direct evidence of oil contamination observed downgradient of IHSS	Potential Treatment Technologies if further investigation reveals fueled oil contamination: Soil Gas Extraction w/oil gas treat Bioremediation Thermal Desorption Incineration

Rocky Flats Plant
OU 1

881 Hillside Data from Phase I and Phase II Investigations

Table 1

Initial Review of Potentially Applicable Treatment Technologies

IHSS #	IHSS Description	Borehole or Well Number	Affected Media	Preliminary Contaminants of Concern	Range of Contaminant Concentration	Approximate Extent of Contamination	Potentially Applicable Treatment Technologies
1191	Multiple Solvent Spill Sites	0887 1287 5787	Soil	2 Butanone (MEK)	20-100 µg/kg	Large area with	Potential Treatment Technologies for soils
	IHSS 1, in re w at of	0887	Soil	Benzofluoranthene	36 µg/kg	xt ns v low to-	Soil G Extraction w/ ft gas
	Bldg 881 which was used as a	0887	Soil	Benzofluoranthene	34 µg/kg	moderate organic	treat
	fuel storage site beginning	0887	Soil	Chrysene	35 µg/kg	c namination	Bioremediation
	1967 The fuel stored in	0887	Soil	Fluoranthene	42 µg/kg	Moderate-to-high	Thermal Desorption
	the area not known	0887	Soil	Phenanthrene	110 µg/kg	VOC contamination	Inherent on
	quantities and types of soil	0887	Soil	Pyrene	92 µg/kg	in groundwater	In situ Steam Stripping
	contaminants	0887 5787	Soil	Tetra chloroethene	110 µg/kg	Surface soil	Soil Flushing
		1487	Soil	1,1,2,2-Tetrachloroethane	5-96 µg/kg	contaminated with	
		1487 5787	Soil	Trichloroethene	5 µg/kg	radon levels	
		5787	Soil	1,1,1-Trichloroethane	7150 µg/kg	Approximate	Potential Treatment Technologies
		5787	Soil	1,1,2-Trichloroethene	10-110 µg/kg	surface area of	for surface soils contaminated with
		5787	Soil	1,1-Dichloroethene	6-27 µg/kg	IHSS quality	radon levels
		5787	Soil	1,2-Dichloroethane	8 µg/kg	600 x300	Soil Washing
		5787	Soil	Bromomethane	510 µg/kg		High Gradient Magnetic Separation
		5787	Soil	Toluene	6 µg/kg		
		1287	Soil	Mercury	6-25 µg/kg		
		1487	Soil	Cadmium	163 mg/kg		
		1287 5787	Soil	Cyanide	64-9 mg/kg		
		1487 5787	Soil	Oil & Grease	2-45 mg/kg		
		0887 1287 1487	Soil	Cesium-137	103563 mg/kg		
		1487	Soil	Americium	0117 pCi/g		
		881 1617 881 1819	Soil	Uranium 233 234	001-01 pCi/g		
		881 1617 881 1819	Surface Soil	Uranium 238	10-60 pCi/g		
		881 1617 881 1819	Surface Soil	Plutonium	550-3000 pCi/g		
		0587 1074	Groundwater	Chloroform	009-078 pCi/g		
		0587 1074 4387	Groundwater	Carbon Tetrachloride	8-100 µg/l		
		1074 4387	Groundwater	Tetrachloroethene	170-8100 µg/l		
		0587 1074 4387	Groundwater	Trichloroethene	350-8100 µg/l		
		1074 4387	Groundwater	1,1-Dichloroethene	45-3600 µg/l		
		0587 1074 4387	Groundwater	1,2-Dichloroethane	190-32687 µg/l		
		1074 4387	Groundwater	1,1,1-Trichloroethane	25-140 µg/l		
		1074	Groundwater	Vinyl Acetate	312 2800 µg/l		
		4387	Groundwater	1,2-Dichloroethene	39 µg/l		
		4387	Groundwater	Benzene	5070 µg/l		

Rocky Flats Plant

OU 1

881 Hillside Data from Phase I and Phase II Investigations

Table 1

Initial Review of Potentially Applicable Treatment Technologies

IHSS #	IHSS Description	Borehole or Well Number	Affected Media	Preliminary Contaminants of Concern	Range of Contaminant Concentrations	Approximate Extent of Contamination	Potentially Applicable Treatment Technologies
119 2	Multiple Solid Spill Sites The IHSS very similar to IHSS 119 1 except that the small crater located to the east of IHSS 119 1. The description of the sites for IHSS 119 1 applies to the IHSS	5887 5887 5887 5987 1687 1687 4587 881 1/2/3 881 1/2/3 881 1/2/3	Soil Soils Soil Soils Soil Groundwater Surface Soil Surface Soil Surface Soil	1,1,1 Trichloroethene Trichloroethene Oil & Grease Cyanide Plutonium Carbon Disulfide Uranium 233 234 Uranium 238 Plutonium	10-42 µg/kg 7.8 µg/kg 4.3-5 mg/kg 1.1-6.8 mg/kg 0.91 pCi/g 5 µg/l 0.56-0.82 pCi/g 0.6-0.91 pCi/g 2.4-4.8 pCi/g	Large area with low organic contamination	Potential Treatment Technologies if further investigation reveals more significant organic contamination Soil G Extraction w/off gas treatment Bioremediation Thermal Desorption Incineration Soil Flushing
130	Radioactive Site 800 Area Site #1 Disposal site of Uranium and Plutonium contaminated soil	881 7 881 7 881 7	Surface Soil Surface Soil Surface Soil	Uranium 223 234 Uranium 238 Plutonium	0.74 pCi/g 0.75 pCi/g 0.63 pCi/g	Data from soil borings within the boundaries and downgradient well indicate no organic metal or rad contamination	Need pending confirmation of no contamination during Phase III RI



successfully applied to the treatment of these contaminants in the groundwater medium. The potentially applicable soil treatment technologies noted in Table 1 were screened with regard to potential effectiveness and implementability and at the concurrence of technical representatives from DOE EG&G Rocky Flats and Dames & Moore soil flushing bioremediation and radio frequency heating were retained for further treatability study investigation. It was concluded that treatability studies on these three technologies required soil samples which were considered representative of in situ conditions. As a result a field sampling plan was prepared for the collection of undisturbed soil core samples containing VOCs. The soil cores were to include saturated soils.

Treatability Study Work Plan and Field Sampling Plan

Under the direction of EG&G a TSWP was prepared to outline procedures to be followed during treatability testing of soil flushing bioremediation and radio frequency heating. The TSWP was structured to provide proof of concept evaluations of these technologies. Soil flushing was considered to have the highest potential for actual site implementation due to its proven effectiveness at other similarly contaminated sites; therefore it was considered the primary technology for treatability testing. Proof-of-concept technology evaluations are typically performed through laboratory or small bench scale tests prior to initiating pilot scale studies. These evaluations are intended to identify possible shortcomings in a technology with regard to its effectiveness and/or implementability. Such shortcomings would eliminate a technology from further consideration.

The scope of tests for soil flushing outlined in the TSWP were developed to provide 1) information to screen potential flushing solutions for their ability to remove contaminants from the OU1 subsurface soil, 2) optimum concentrations of the most effective flushing solutions, and 3) a demonstration of the performance of the chosen flushing solution on undisturbed soil cores from OU1 at the bench scale. Proof of concept for soil flushing would be evaluated on the basis of estimated concentration isotherms for the varying contaminant concentrations found in OU1 subsurface soils.

The biotreatment study presented in the TSWP was not developed to test the biodegradability of individual compounds. Instead, the TSWP had procedures to allow proof of concept to be judged based on an evaluation of existing microbial populations in soils at OU1 microbial nutrient requirements and the physical characteristics of the native soils. Physical characterization is needed to assess the ability to apply an in situ biotreatment system.

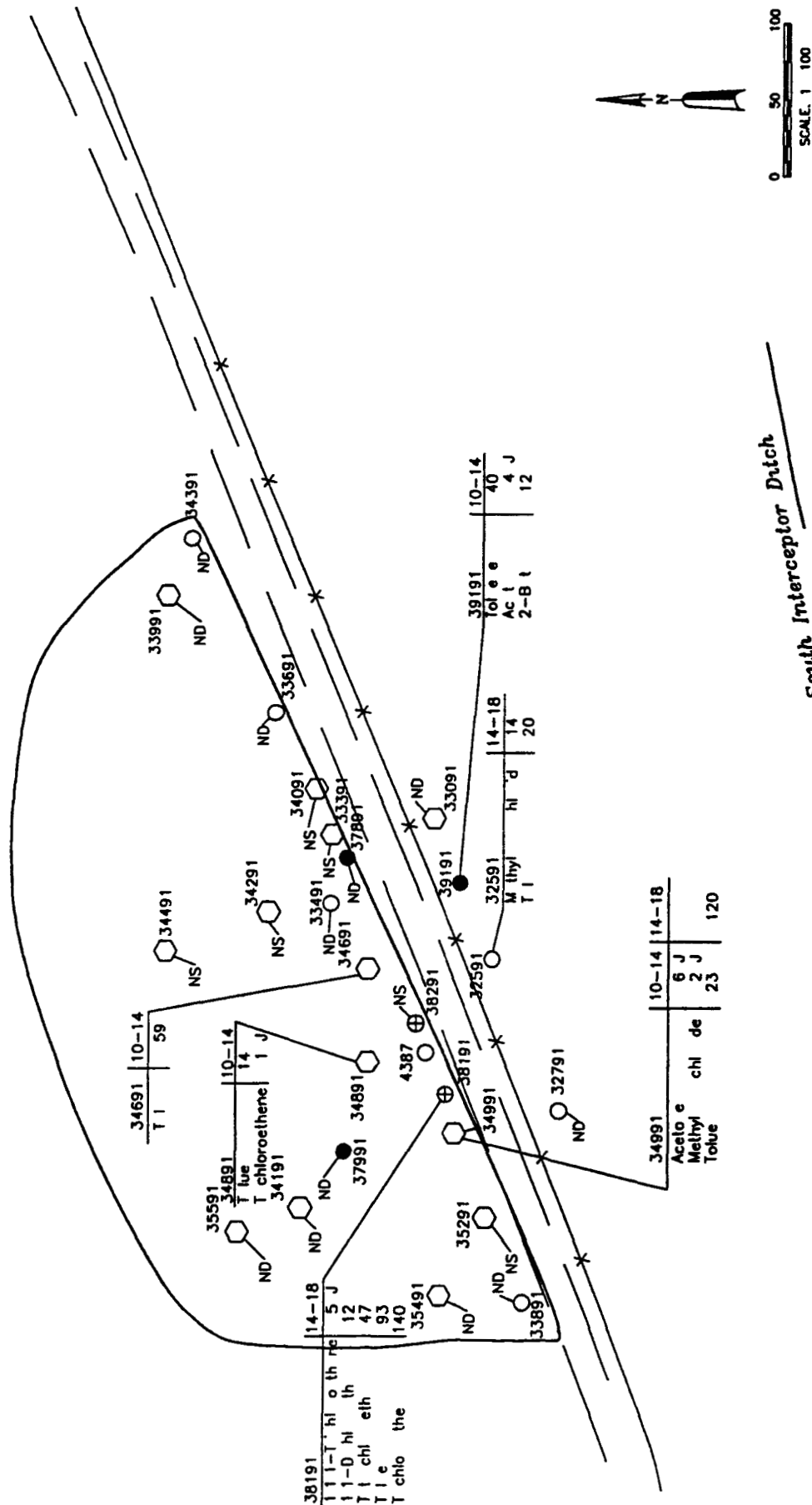
Specific treatability test procedures for radio frequency heating were not developed with the TSWP. These procedures were to be completed at a later date upon the identification of an appropriate treatability vendor.

The FSP which was included as an attachment to the TSWP identified 10 sampling locations within the vicinity of well 4387. However, due to management constraints, only two locations were actually sampled. Of the 10, these two locations are in closest proximity to well 4387. Figure 2 from the recent Phase III RFI/RI Draft Final Report, indicates that contaminated subsurface soils were likely to be encountered at these locations.

Field Sampling

Drilling at each of the sampling locations consisted of the completion of two separate borings. A first or exploratory boring identified intervals of contamination. A second boring adjacent to the first boring targeted the intervals of contamination for collection of undisturbed samples. Targeted intervals were identified through ambient temperature headspace (ATH) screening of the exploratory boring soils using an HNu meter equipped with a photoionization detector (PID) having an 11.7 eV bulb. Any interval which registered an HNu reading greater than or equal to 2 ppm above background was noted as a target.

1191



U S DEPARTMENT OF ENERGY
Rocky Flat Plant Grounds

861 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Volatile Organic Compounds Detected
in IHSS 1191 10 to 18 Feet

Figure 2

EXPLANATION			
IHSS Boundary	Soil Sample Location	Loc 1	Depth Interval
31891	31891	36491	6-10
32791	32791	Toluene	20
39191	39191	Anhydrous	micograms per kilogram (g/kg)
38191	38191	NS-Location Not Sampled	
Stream	Stream	ND-Analytes Not Detected	
Road	Road		
Fence	Fence		

OCTOBER 1992

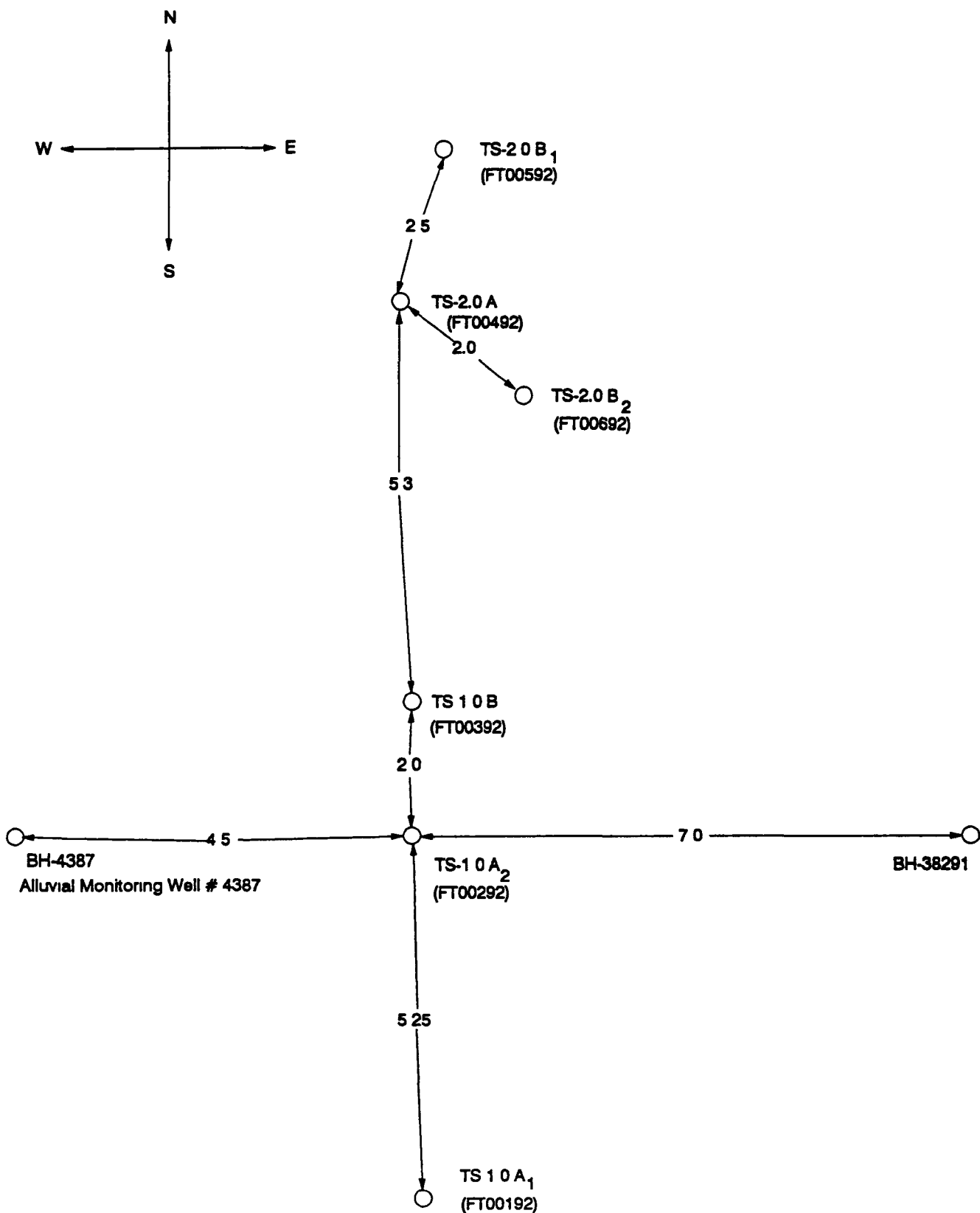
interval for the second boring Previous OU1 field investigations used PHDs having 10.2 eV bulbs The 11.7 eV bulb which is more sensitive to a greater variety of VOCs than the 10.2 eV bulb was chosen for the treatability study field screening in anticipation of encountering low VOC concentrations

Figure 3 identifies the locations (relative to well 4387) where sampling occurred. There were three exploratory borings (labeled as A borings on the figure) and three undisturbed sample borings (labeled as B borings on the figure) Only two A and two B borings were considered successful Borings FT00192 an A" boring and FT00592 a B boring were not successful due to 1) FT00192 encountering a significant amount of previously disturbed subsurface soils and 2) FT00592 encountering large cobbles which prevented the adequate collection of representative sample intervals

Attachment 2 contains Rocky Flats Plant Borehole Logs for both the A and B borings the boring log for well 4387 depth to-water data for well 4387 and correspondence from the treatability study laboratory IT Corporation

Characterization of Untreated Soil Samples

Table 2 provides field screening results for the A and B borings and VOC concentrations which were determined by IT Corporation As noted in Table 2 and supported by the borehole logs boreholes FT00292 FT00492 and FT00592 were drilled to a depth of approximately 19 feet. Based on depth to-water data for well 4387 it was expected that saturated soils would be encountered at a depth ranging from 8 to 12 feet, however saturated soils were not reached. Per correspondence from IT Corporation dated October 19 1992 and November 11 1992 except for one sample interval there were no significant levels of contamination in the sample intervals examined, including those intervals that were likely to have been saturated with contaminated groundwater near well 4387 The exception was at borehole FT00692 which had an HNu reading of 500 ppm in the field and an analytical result of 940 µg/kg (0.940 ppm) VOC concentration (attributable to tetrachloroethene) This



(P:\EBRFP\BOA\670\DRAW\SMPLGEM.DRW)

Figure 3 Sampling Location Detail

Table 2

SAMPLING LOCATION	BOEHOLE ID NUMBER	SAMPLE DEPTH	HNU READING	SAMPLE WEIGHT	VOC CONC RESULTS
-----	-----	-----	-----	-----	-----
		feet	ppm	g	ug/kg
=====	=====	=====	=====	=====	=====
TS-1 0 A1 (FT00192)	BH10000WSb	2 0-4 2	2		
	BH10001WSb	2 0-4 2	2		
	BH10002WSb	2 0-4 2	2		
	BH10003WSb	4 2-5 8	1		
	BH10004WSb	4 2-5 8	1		
	BH10005WSb	4 2-5 8	1		
TS-1 0 A2 (FT00292)	BH10006WSb	0-1 7	5	18 2	11 5
	BH10007WSb	1 7-3 4	16	17 4	25 8
	BH10008WSb	3 4-5 7	2		
	BH10009WSb	5 7-9 7	8	18 5	4 8
	BH10010WSb	7 7-9 7	1		
	BH10011WSb	11 7-13 7		bulk sample	
	BH10012WSb	14 7-15 7		bulk sample	
	BH10013WSb	15 7-17 7		bulk sample	
	BH10014WSb	17 7-18 7		bulk sample	
TS-1 0 B (FT00392)	BH10009WSt	6 0-8 0	1	25 3	1 9
	BH10010WSt	8 0-10 0	5	23 2	1 6
TS-2 0 A (FT00492)	BH10015WSb	0-2 1	3 5		
	BH10016WSb	2 1-4 1	14	21 6	27 6
	BH10017WSb	4 1-6 1	20	18 8	3 5
	BH10018WSb	6 1-8 1	30	20 3	4 7
	BH10019WSb	8 1-10 1	5	15 9	19 9
	BH10020WSb	10 1-12 1	1		
	BH10021WSb	12 1-14 1	1	bulk sample	
	BH10022WSb	14 1-16 1	9	bulk sample	
	BH10023WSb	16 1-18 1	8	bulk sample	
	BH10024WSb	18 1-19 1	4	bulk sample	
TS-2 0 B1 (FT00592)	BH10015WSt	0-2 4	4 5	16 5	12 5
	BH10016WSt	sample discarded no recovery			
	BH10017WSt	5 2-6 7	1 5	18 3	2 8
	BH10018WSt	6 7-8 7	1	14 8	2 6
	BH10019WSt	8 7-10 7	13	25 3	1 0
	BH10020WSt	no sample recovered due to large cobbles			
	BH10021WSt	has been pushed ahead of tube			
	BH10022WSt	14 7-16 7	1	19 6	5 4
	BH10023WSt	16 7-18 7	18	18 4	8 9
TS-2 0 B2 (FT00692)	BH10027WSt	0-2 25	80	15 7	18 3
	BH10028WSt	2 25-3 0	-		
	BH10029WSt	3 0-4 5	500	5 0	940(*)

* Analyzed sample was a composite of BH10028WSt and BH10029WSt

reported tetrachlorethene concentration is somewhat elevated above other analyses (for tetrachloroethene) in the vicinity. However, it is consistent with other results which demonstrate all individual VOC reports in subsurface soils are less than 1 ppm.

Recommendations on Treatability Studies

The treatability study sampling effort supports the belief that VOC contamination in subsurface soils is very limited. This support stems from the failure of treatability study sampling to retrieve significantly contaminated saturated zone and vadose zone soils from an area of OU1 which has been shown through previous investigations to be an area with elevated VOC concentrations in subsurface soil and groundwater. As discussed in the previous section, IT Corporation's analytical results verify that subsurface soil contamination was not found in significant amounts on the treatability study samples retrieved.

Treatability study sampling has reinforced the finding of the remedial investigation that contamination associated with groundwater is limited to the immediate vicinity of alluvial monitoring well number 4387. Since significant VOC contamination was not found on subsurface soils that have likely been saturated with groundwater near well 4387 (based on water table data for the area), it is also reasonable to surmise that 1) VOC contamination remains with the groundwater, i.e., the ability of subsurface soils to retain VOCs through adsorption or other similar mechanisms is low, and/or 2) VOC contaminated groundwater exists in pockets in the subsurface soil and remains relatively undisturbed during groundwater table level fluctuation events.

Treatability studies for soil flushing, biotreatment, and radio frequency heating would provide no significant benefits to evaluating feasibility study alternatives for OU1 based on the additional information obtained during the treatability study sampling effort. Further definition regarding the limited extent of subsurface soil VOC contamination obtained through treatability sampling discounts the potential benefits of soil flushing, biotreatment, and radio frequency heating as in situ soil remediation technologies for OU1.

ROCKY FLATS PLANT BOREHOLE LOG

PAGE 1 OF 1




Borehole Number FT00192
 Location North: _____ East: _____
 Date 8/21/92
 Geologist: RDM
 Drilling Equip. B61 Mob 1 Dr 11

Surface Elevation. _____
 Area. B81 H.S.
 Total Depth. 6.2
 Company Weston Project No 1455191
 Sample Type Continuous Core

EG&G LOGGING SUPERVISOR -

APPROVAL _____

DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL FIELD MEASUREMENT	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
No core kept	00	2	BM1000015 BM1000113 BM100215				CL	0		00 - 20 SILTY CLAY w th sand, d sky yellow sh brown (10 YR 2 1/2)
	20							1		SAND: poorly sorted, very fine to med m grained Low pl st ty, dry
	42	11	BM100215 BM100215 BM100215				SM	2		20 - 42 SILTY SAND with sand medium brown (5 YR 4 1/4), SAND fine to coarse grained, quartzose and feldspathic
	62							4		42 - 58 - SILTY CLAY w th gravel as above with cobbles 58 62 SAND - fill from vent fine to medium grained moderate yellowish brown (10 YR 5 1/4); dry
								5		TD 62'
								6		
								7		
								8		
								9		
								10		

NOTES General USCS is modified for this log as follows

Materials amounts are estimated by % volume instead of % weight.

(1) Badly broken core accurate footage measurements not possible

(2) Core breaks cannot be matched accurate footage measurements not possible

HOLLOW STEM AUGER DRILLING FIELD ACTIVITIES REPORT

PROJECT NAME 1HSS 1191
 BOREHOLE IDENTIFICATION FT 00192 DATE 8/21/92
 WEATHER CONDITIONS 80 F, clear, calm
 RIG TYPE MOBILE B61
 DRILLER & DRILLING COMPANY ROGER SHARP BOYLES BROS.
 GEOLOGIST Rick Morrow
 CREW MEMBER(S) DOUG SCHROEDER
 SUBCONTRACTOR(S) JIM VOORHIES (URIC ENV.)
GREG GALLEGOS (JENNISON CONST.)
 TOTAL DEPTH (FT) 62 BORING DIAMETER (IN) 7"
 DEPTH TO BEDROCK (FT) / WATER LEVEL (FT) /
 AUGERS & BIT TYPE & I.D. (IN) 1HSA's 3 1/4'
 DECONTAMINATION All drill equipment decontaminated at RFP
decon pad

SAMPLE NUMBERS TYPES AND DEPTHS (FT)

SAMPLE #	TYPE	DEPTH	SAMPLE #	TYPE	DEPTH	SAMPLE #	TYPE	DEPTH
BH10000WS	VOR	2242	-					
BH10001WS	Red Screen	11						
BH10002WS	BNA	1						
BH10003WS	VOR	4262						
BH10004WS	Red Screen	11						
BH10005WS	BNA	11						

HAMMER SIZE (LB) _____

END OF DAY STATUS (CHECK 1) In Progress _____ Drilling Completed ☒

CHRONOLOGICAL RECORD OF ACTIVITIES (AND COMMENTS)

1052 start drilling
1157- finished drilling

COMPLETED BY Rick Morrow

Print Name

Signature

Date

SUBCONTRACTOR WE TON

BOREHOLE ABANDONMENT
FIELD ACTIVITIES REPORT

PROJECT NAME 1455 119 1

BOREHOLE IDENTIFICATION FT00192 DATE 8/26/92

WEATHER CONDITIONS 14 40's F, foggy

RIG TYPE B61 Mobil Drill

DRILLER & DRILLING COMPANY Roger Sharp Boules Bros

GEOLOGIST Ken Miller

CREW MEMBER(S) Doug Schaefer

SUBCONTRACTOR(S) Jim Voorhes - Ure Enu
Greg Gallegos - Jensen Const

TOTAL DEPTH (FT) 62 BORING DIAMETER (IN) 7 1/4

WATER LEVEL (FT) /

TREMIE & PUMPING EQUIPMENT 1" steel pipe, cement grout mixer

GROUT VOLUME PLACED (FT³) 15 cu ft

CASING REMOVED
Type/Length (Ft)/Diameter (In) /


CASING LEFT IN PLACE
Type/Length (Ft)/Diameter (In) /

SURFACE SEAL Date Set 8/26/92 Depth (Ft) 62

CHRONOLOGICAL RECORD OF ACTIVITIES (AND COMMENTS)

1105 Prep to grout hole

1205 - grouting complete

COMPLETED BY Ken Miller  8/26/92
Print Name Signature Date

SUBCONTRACTOR 1, ESTON

ROCKY FLATS PLANT BOREHOLE LOG

PAGE 2 OF 2

Borehole Number FT00292
 Location North: _____ East: _____
 Date _____
 Geologist: _____
 Drilling Equip.: _____

Surface Elevation: _____
 Area: _____
 Total Depth: _____
 Company: _____ Project No. _____
 Sample Type: _____

EG&G LOGGING SUPERVISOR -

APPROVAL _____

DATE _____

TOP/BOTTOM OF CORE IN FEET	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL FIELD MEASUREMENT	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL LITHOLOGIC LOG	SAMPLE DESCRIPTION
	R ₁ 6	Center b +						10	X	Bed rock Co ta T at 10 0'
	10 7									
	R ₂ 7	4						11	///	10 7 - 12 1 Sample contains slough from above center b + run Mostly fractured quartzite gravel and clay
	11 7									
	R _{un} 8	20	BH0001105					12	---	
	13 7							13	---	12 1 - 14 7 CLAYSTONE - dusky yellow (54 6/4) silty and heavy with dark yellow orange (10 1/2 6/6), highly weathered Ca bon (NaO ₂) blebs, low plasticity, consolidated, damp
	R _{un} 9	20	BH0001205				41	14	---	13 7
	15 7							15	---	14 7 - 18 7 SILTY CLAYSTONE, med m dark gray (N4/0), FeO ₂ ve lets, blocky, consolidated, non plastic, moderately friable, dry
	R ₁ 1	20	BH0001305					16	---	
	17 7							17	---	
	R _h h	10	BH0001405					18	---	
	18 7							19	---	Drilled TO 18 7

NOTES General: USCS is modified for this log as follows

Materials amounts are estimated by % volume instead of % weight.

(1) Badly broken core accurate footage measurements not possible

(2) Core breaks cannot be matched accurate footage measurements not possible

HOLLOW STEM AUGER DRILLING FIELD ACTIVITIES REPORT

PROJECT NAME 1HSS 191
 BOREHOLE IDENTIFICATION FT00292 DATE 8/25/92
 WEATHER CONDITIONS 50 s F, cloudy, wind from the east
 RIG TYPE MOBILE B61
 DRILLER & DRILLING COMPANY ROGER SHARP BOYLES BROS.
 GEOLOGIST KE Miller
 CREW MEMBER(S) DOUG SCHROER
 SUBCONTRACTOR(S) JIM VOORHIES (URIC ENV.)
GREG GALLEGOS (JENNISON CONST)
 TOTAL DEPTH (FT) 180 BORING DIAMETER (IN) 7 1/4
 DEPTH TO BEDROCK (FT) 100 WATER LEVEL (FT)
 AUGERS & BIT TYPE & LD (IN) HSA's 3 1/4
 DECONTAMINATION All drill equip deconed at RFP clean pad

SAMPLE NUMBERS TYPES AND DEPTHS (FT)

SAMPLE #	TYPE	DEPTH	SAMPLE #	TYPE	DEPTH	SAMPLE #	TYPE	DEPTH
BH10006 WS	Sub A	0-17'	BH10013 WS	Bulk	157-127			
BH10007 WS	"	17-37'	BH10014 WS	Bulk	177-197			
BH10008 WS	"	37-57'						
BH10009 WS	"	57-77'						
BH10010 WS	"	77-97'						
BH10011 WS	Bulk	117-137'						
BH10012 WS	Bulk	137-157'						

HAMMER SIZE (LB) _____

END OF DAY STATUS (CHECK 1) In Progress _____ Drilling Completed ☒

CHRONOLOGICAL RECORD OF ACTIVITIES (AND COMMENTS)

1310 start drilling
1510 - complete drilling
1530 - decon out, back to trailer
1600 - prep samples

COMPLETED BY Keith Miller

Print Name

[Signature]

Signature

8/25/92

Date

SUBCONTRACTOR WESTON

BOREHOLE ABANDONMENT
FIELD ACTIVITIES REPORT

PROJECT NAME 1HSS 1191

BOREHOLE IDENTIFICATION - FT00292 DATE 8/26/92

WEATHER CONDITIONS H 40s F, Foggy

RIG TYPE BG1 Mob 1 Dr 11

DRILLER & DRILLING COMPANY Roger Sharp Bowles Bros

GEOLOGIST KE Miller

CREW MEMBER(S) Doug Schroer

SUBCONTRACTOR(S) Jim Voorhies - Ur & Enu
Greg Gallagos - Jenn Son Const

TOTAL DEPTH (FT) 180 BORING DIAMETER (IN) 7 1/4

WATER LEVEL (FT) /

TREMIE & PUMPING EQUIPMENT 1" Steel p oe, chem grout mixer

GROUT VOLUME PLACED (FT³) ≈ 45 cu ft

CASING REMOVED
Type/Length (Ft)/Diameter (In) /

CASING LEFT IN PLACE
Type/Length (Ft)/Diameter (In) /

SURFACE SEAL Date Set 8/26/92 Depth (Ft) 180

CHRONOLOGICAL RECORD OF ACTIVITIES (AND COMMENTS)

1105 - Prepare to grout hole

1205 - grouting complete

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COMPLETED BY Kenneth Miller [Signature] 8/26/92
Print Name Signature Date

SUBCONTRACTOR. WESTON

ROCKY FLATS PLANT BOREHOLE LOG

PAGE 1 OF 2

Borehole Number FT 00392
 Location North: _____ East: _____
 Date 8/26/92
 Geologist KEM
 Drilling Equip. B61 Mob 1 Dr 11

Surface Elevation: _____
 Area B81 HS
 Total Depth: 10.5
 Company WESTON Project No UHSS 1A 1
 Sample Type continuous and center bit

EG&G LOGGING SUPERVISOR -

APPROVAL _____

DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE INTERVAL FIELD MEASUREMENT	SAMPLE NUMBER	FRACTURE ANGLE	SEDIMENT ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL LITHOLOGIC LOG	SAMPLE DESCRIPTION
No core kept	00							0		00 - 60 Center Bit Used Cuttings Logged
	Run 1	center bit					CL	1		00 - 44 CLAY dust, brown (5YR 2/2) trace fr. it red gravel damp
	44							2		
	Run 2							3		
	60							4		
	Run 3					5-10% gravel	CL	5		44 - 60 SILTY + sandy CLAY, red m brown (5YR 4/4), low plasticity, gravel is quartzite, damp
	80						CL	6		60 - 80 CLAY with less than 1% sand, dark yellow sh brown (10YR 4/2), sandy fine grained quartzite appears stiff FeO ₂ stains damp
	Run 4						CL	7		
	100							8		80 - 100 CLAY with fine grained quartzite gravel, dark yellow sh brown (10YR 4/2) to dark yellow (5Y 6/4)
								9		GRAVEL of actual quartzite, appearance of sample st FF damp
								10		

NOTES General: USCS is modified for this log as follows

Materials amounts are estimated by % volume instead of % weight.

(1) Badly broken core accurate footage measurements not possible

(2) Core breaks cannot be matched accurate footage measurements not possible

PAGE 2 OF 2

Surface Elevation _____
Area. _____
Total Depth. _____
Company _____ Project No _____
Sample Type _____

APPROVAL _____ DATE _____

[illegible]

(2) Core breaks cannot be matched accurate footage measurements not possible

HOLLOW STEM AUGER DRILLING
FIELD ACTIVITIES REPORT

PROJECT NAME 1H55 1191
BOREHOLE IDENTIFICATION FT00392 DATE 8/26/92
WEATHER CONDITIONS 11, 40s F, foggy
RIG TYPE MOBILE B61
DRILLER & DRILLING COMPANY ROGER SHARP BOYLES BROS.
GEOLOGIST KE Miller
CREW MEMBER(S) DOUG SCHROEDER
SUBCONTRACTOR(S) JIM VOORHIES (URIE ENV.)
GREG GALLEGOS (JENNISON CONST)
TOTAL DEPTH (FT) 10.5 BORING DIAMETER (IN) 7 1/4
DEPTH TO BEDROCK (FT) / WATER LEVEL (FT) /
AUGERS & BIT TYPE & LD (IN) HSA 3, 3 1/4'
DECONTAMINATION All drill equipment decontaminated at RFP decon pad

SAMPLE NUMBERS TYPES AND DEPTHS (FT)

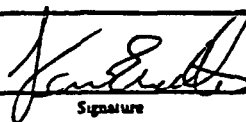
SAMPLE #	TYPE	DEPTH	SAMPLE #	TYPE	DEPTH	SAMPLE #	TYPE	DEPTH
BH10009WS	5 ft A48	60-80						
BH10000WS	"	80-100						

HAMMER SIZE (LB) _____

END-OF DAY STATUS (CHECK 1) In Progress _____ Drilling Completed ☒

CHRONOLOGICAL RECORD OF ACTIVITIES (AND COMMENTS)

0905 - begin drilling
1015 - drilling complete

COMPLETED BY Kenneth Miller
Print Name
Signature8/26/92
DateSUBCONTRACTOR WESTON

BOREHOLE ABANDONMENT
FIELD ACTIVITIES REPORT

PROJECT NAME 1HSS 119-1

BOREHOLE IDENTIFICATION FT00392 DATE 8/26/92

WEATHER CONDITIONS H 40's F, Foggy

RIG TYPE B61 Mob, 1 Drill

DRILLER & DRILLING COMPANY Roger Sharp, Boyles Bros

GEOLOGIST KE Miller

CREW MEMBER(S) Doug Schroer

SUBCONTRACTOR(S) Jim Voorhes - Ure Enu
Gus Gallegos - Jennson Const

TOTAL DEPTH (FT) 105 BORING DIAMETER (IN) 7 1/4

WATER LEVEL (FT) /

TREMIE & PUMPING EQUIPMENT 1" steel pipe, chem grout mixer

GROUT VOLUME PLACED (FT³) ≈ 3 cu/ft

CASING REMOVED
Type/Length (Ft)/Diameter (In) /

CASING LEFT IN PLACE
Type/Length (Ft)/Diameter (In) /

SURFACE SEAL Date Set 8/26/92 Depth (Ft) 105

CHRONOLOGICAL RECORD OF ACTIVITIES (AND COMMENTS)

1105 - Prepare to grout hole

1205 - grouting complete

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COMPLETED BY Kenneth Miller [Signature] 8/26/92

Print Name Signature Date

SUBCONTRACTOR WESTON

PAGE 1 OF 2

Surface Elevation. _____
Area. 221 WS
Total Depth: 191'
Company WESTON Project No 1455 119.1
Sample Type cont move core

APPROVAL

DATE _____

TOP OF CORE OF CORE IN BOX	TOP OF OF INTERVAL	FEET OF CORE IN INTERVAL FIELD MEASUREMENT	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL LITHOLOGIC LOG	SAMPLE DESCRIPTION
No core kept	00						OL	0		0.0'-0.4' - Topsoil - med um brown (SVR 3/4), o g nics, loose damp to dry
	Run 1	13	BH10015WS				CL	1		0.4'-13' - SILTY CLAY with fractured cobbles and g med and s nd, dusky brown (SVR 2/2)
	21							2		SAND - less than trace well sorted fine grained quartzose, GRAVEL - fractured quartzite, low plasticity, st ff, dry
	Run 2	18	BH10016WS				CL	3		21-61 CLAY with sand and gravel, med um brown (SVR 4/4) and light lue brown (SVR 5/6) grading to light lue gray (SVR 5/6),
	41							4		SAND well sorted fine gr med quartzose GRAVEL - + a sub ng lue to s brown quartzite, + a organics l w plasticity, entire sample st ff damp to dry
	Run 3	12	BH10017WS				CL	5		
	61							6		61-75 SANDY CLAY - light brown (SVR 5/6),
	Run 4	20	BH10017WS			30/ SAND	CL	7		SAND fine gr med quartzose GRAVEL fr e quartzite, f du al n + ne Sample st ff low plasticity, damp
	81						SC	8		75-81 CLAYEY SAND light b w (SVR 5/6)
	Run 5	4	BH10019WS					9		SAND fine gr med quartzose GRAVEL large for tu ed quartzite a sh e damp
								10		81-101 SANDY CLAY - desc pt n same s 61-75 sample

(2) Core breaks cannot be matched accurate footage measurements not possible

ROCKY FLATS PLANT BOREHOLE LOG

PAGE 2 OF 2

Borehole Number FT00402
 Location North: _____ East: _____
 Date _____
 Geologist: _____
 Drilling Equip.: _____

Surface Elevation: _____
 Area: _____
 Total Depth: _____
 Company: _____ Project No: _____
 Sample Type: _____

EG&G LOGGING SUPERVISOR -

APPROVAL _____

DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL FIELD MEASUREMENT	SAMPLE NUMBER	FRACURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SON/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	10.1						CL	10	///	10.1-10.5 Same as 6.1-7.5 sample TOP OF BEDROCK 10.5
	Run 6	2.0	BH10020WS					11	///	10.5-18.1 SILTY CLAYSTONE light olive gray (5Y 5/2) with dark yellow sh or nge (10YR 4/6) st ns n upper part on grading to med um gray (N 5/) at 15.0'
	12.1							12	///	Low to med um plast city, consolidated, highly weathered upper zone, with abundant FeO ₂ staining N to highly
	Run 7	2.0	BH1021WS					13	///	Frable (16.1), non plast c and blocky 1 lower portion (16.1-18.1) with MnO ₂ staining in part ngs Sample is dry from
	14.1							14	///	10.5-18.1'
	Run 8	2.0	BH10022WS					15	///	
	16.1							16	///	
	Run 9	2.0	BH10023WS					17	///	
	18.1							18	///	18.1-19.1 CLAYSTONE GRAOWA TO SILTSTONE light olive gray (5Y 6/1), moderately frable crumbles easily, platy, weathered with trace very fine gr med quartz so sand a shoe, dry.
	Run 10	1.0	BH1024WS					19	///	
	19.1							20	///	TO 19.1

NOTES General USCS is modified for this log as follows

Materials amounts are estimated by % volume instead of % weight.

(1) Badly broken core accurate footage measurements not possible

(2) Core breaks cannot be matched accurate footage measurements not possible

HOLLOW-STEM AUGER DRILLING FIELD ACTIVITIES REPORT

PROJECT NAME 1455 1191
 BOREHOLE IDENTIFICATION FT00492 DATE 8/26/92
 WEATHER CONDITIONS 60°F, partly cloudy
 RIG TYPE MOBILE B61
 DRILLER & DRILLING COMPANY ROGER SHARP BOYLES BROS.
 GEOLOGIST KE Miller
 CREW MEMBER(S) DOUG SCHROER
 SUBCONTRACTOR(S) JIM VOORHIES (URIC ENV.)
GREG GALLEGOS (JENNISON CONST)
 TOTAL DEPTH (FT) 19.1 BORING DIAMETER (IN) 7 1/4
 DEPTH TO BEDROCK (FT) 10.5 WATER LEVEL (FT) ✓
 AUGERS & BIT TYPE & I.D (IN) H5A5, 3 1/4
 DECONTAMINATION All drill equipment decontaminated at RFP pad

SAMPLE NUMBERS TYPES AND DEPTHS (FT)

SAMPLE #	TYPE	DEPTH	SAMPLE #	TYPE	DEPTH	SAMPLE #	TYPE	DEPTH
BH10015WS	Sub A	0-0-21	BH10022WS	Bulk	141-161			
BH10016WS		21-41	BH10023WS		161-181			
BH10017WS		41-61	BH10024WS		181-190			
BH10018WS		61-81						
BH10019WS		81-101						
BH10020WS		101-121						
BH10021WS	Bulk	121-141						

HAMMER SIZE (LB) _____

END OF DAY STATUS (CHECK 1) In Progress _____ Drilling Completed ☒

CHRONOLOGICAL RECORD OF ACTIVITIES (AND COMMENTS)

1437 - began drilling
1600 - drilling complete
1620 - head to trailer to prep samples

COMPLETED BY Kenneth Miller [Signature] 8/26/92
Print Name Signature Date
 SUBCONTRACTOR WESTON

BOREHOLE ABANDONMENT
FIELD ACTIVITIES REPORT

PROJECT NAME 1455 119.1

BOREHOLE IDENTIFICATION - FT00492 DATE 8/28/92

WEATHER CONDITIONS 70°F, clear, calm

RIG TYPE B61 Mob 1 Dr 11

DRILLER & DRILLING COMPANY Roger Sharp Boyles Bros

GEOLOGIST KE Miller

CREW MEMBER(S) Dana Schroer

SUBCONTRACTOR(S) Jim Voorhies - Urie Enui
Greg Gallegos - Jennison Const

TOTAL DEPTH (FT) 191 BORING DIAMETER (IN) 7 1/4

WATER LEVEL (FT) /

TREMIE & PUMPING EQUIPMENT 1" steel pipe chem grout mixer

GROUT VOLUME PLACED (FT³) ~ 54 cu/ft

CASING REMOVED
Type/Length (Ft)/Diameter (In) /

CASING LEFT IN PLACE
Type/Length (Ft)/Diameter (In) /

SURFACE SEAL Date Set 8/20/92 Depth (Ft) 191

CHRONOLOGICAL RECORD OF ACTIVITIES (AND COMMENTS)

1220 - start grouting holes

1350 - grouting completed

* Boreholes FT00492 - FT00692 all grouted at
one time

COMPLETED BY Kenneth Miller [Signature] 8/28/92
Print Name Signature Date

SUBCONTRACTOR WESTON

ROCKY FLATS PLANT BOREHOLE LOG

PAGE 1 OF 2

Borehole Number FT00592
 Location North: _____ East: _____
 Date 8/27/92
 Geologist ICEM
 Drilling Equip 361 Mob 1 Dr 11

Surface Elevation: _____
 Area BB1 HS
 Total Depth: 187
 Company Weston Project No 1HSS 1191
 Sample Type continuous core, center bit

EG&G LOGGING SUPERVISOR -

APPROVAL _____

DATE _____

TOP OF CORE IN BOX	TOP OF CORE INTERVAL	FEET OF CORE IN INTERVAL MEASUREMENT	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL LITHOLOGIC LOG	SAMPLE DESCRIPTION
No core kept	00 Run 1	7	BH10015WS				CL	0		00-52 SILTY CLAY with gravel and tr & sand, dusky brown (5/R 1/2), SAND tr & fine to med ungravel GRAVEL tr re quartzite gravel to cobbles Ent sample appears stiff, damp
	24							1		
	Run 2	00	* sample discarded no core					2		
	47							3		
	Run 3	cent bit						4		
	52							5		52-107' GRAVELLY CLAY with gravel and tr & to 10/ sand, med to brown (5YR 4/4) to light brown (5/R 5/6) SAND trace to 10/ fine to med un grained quartzose GRAVEL Fractured quartzite gravel, 2-6 cm in size poor recovery due to large cobbles, entire sample damp
	Run 4	13	BH1007WS					6		
	67							7		
	Run 5	8	BH10018WS				CL	8		
	87							9		
	26		BH10019WS					10		

NOTES General: USCS is modified for this log as follows

Materials amounts are estimated by % volume instead of % weight.

(1) Badly broken core accurate footage measurements not possible

(2) Core breaks cannot be matched accurate footage measurements not possible

ROCKY FLATS PLANT BOREHOLE LOG

PAGE 2 OF 2

Borehole Number FT02592
 Location North: _____ East: _____
 Date _____
 Geologist: _____
 Drilling Equip _____

Surface Elevation. _____
 Area. _____
 Total Depth. _____
 Company _____ Project No _____
 Sample Type _____

EG&G LOGGING SUPERVISOR -

APPROVAL _____

DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SON/L LITHOLOGIC LOG	SAMPLE DESCRIPTION
No core kept	10.7	6					CL	10		
								11		10.7 - 14.7
								12		* No sample recovered, could not disr n bed ck c n tact due to large cobbles be s pushed ahead of tube
								13		
								14		
	14.7						Y	15		14.7 - 18.7'
								16		SILTY CLAYSTONE Lght lue gray (5Y5/2) grading to med m gray (2.5/6), co s i d e t e, hard, platy, moderately frable, trace siltstone, dry
								17		
								18		
	18.7							19		18.7 Total Depth
								20		* Lith log c desc pt ns made thro gh Lexan sl cu no h d s n

NOTES General USCS is modified for this log as follows

Materials amounts are estimated by % volume instead of % weight.

(1) Badly broken core accurate footage measurements not possible

(2) Core breaks cannot be matched accurate footage measurements not possible

HOLLOW-STEM AUGER DRILLING FIELD ACTIVITIES REPORT

PROJECT NAME 11455 1191
 BOREHOLE IDENTIFICATION ET00592 DATE 8/27/92
 WEATHER CONDITIONS 70'S F, clear
 RIG TYPE MOBILE B61
 DRILLER & DRILLING COMPANY ROGER SHARP BOYLES BROS.
 GEOLOGIST KE Miller
 CREW MEMBER(S) DOUG SCHROEDER
 SUBCONTRACTOR(S) JIM VOORHIES (URIE ENV.)
GREG GALLEGOS (JENNISON CONST)
 TOTAL DEPTH (FT) 187 BORING DIAMETER (IN) 7 1/4
 DEPTH TO BEDROCK (FT) ~ 110 WATER LEVEL (FT) ✓
 AUGERS & BIT TYPE & I.D. (IN) HSA 3 1/4
 DECONTAMINATION All drill equipment decontam at RFP dec pad

SAMPLE NUMBERS TYPES, AND DEPTHS (FT)

SAMPLE #	TYPE	DEPTH	SAMPLE #	TYPE	DEPTH	SAMPLE #	TYPE	DEPTH
BH10015WS	S 6" B	00-24	-					
BH10017WS		52-67						
BH10018WS		67-87						
BH10019WS		87-107						
BH10022WS		147-167						
BH10023WS	↓	167-187						

HAMMER SIZE (LB)

 END-OF DAY STATUS (CHECK 1) In Progress _____ Drilling Completed ☒

CHRONOLOGICAL RECORD OF ACTIVITIES (AND COMMENTS)

1000 - begin drilling
 1220 drilling complete
 1230 - decon out

 COMPLETED BY Kenneth Miller [Signature] 8/27/92
Print Name Signature Date

 SUBCONTRACTOR WESTON

(4011-930-0066-930)XGT32EV JX03/03/929

ROCKY FLATS PLANT BOREHOLE LOG

PAGE 1 OF 1

Borehole Number FT02692
Location North. East:
Date 3/28/92
Geologist: KEM
Drilling Equip.. BE1 Mob/Drill

Surface Elevation: _____
Area. 881 HS _____
Total Depth. 4.5' _____
Company: Weston Project No. 1455 1191
Sample Type continuous core

EG&G LOGGING SUPERVISOR -

APPROVAL

DATE _____

[illegible]

NOTES General: USCS is modified for this log as follows

Materials amounts are estimated by % volume instead of % weight.

(1) Badly broken core accurate footage measurements not possible

(2) Core breaks cannot be matched accurate footage measurements not possible

HOLLOW-STEM AUGER DRILLING FIELD ACTIVITIES REPORT

PROJECT NAME 1HSS 119.1
 BOREHOLE IDENTIFICATION FT00692 DATE 8/28/92
 WEATHER CONDITIONS 70SF, clear, wind from the east
 RIG TYPE MOBILE B61
 DRILLER & DRILLING COMPANY ROGER SHARP BOYLES BROS.
 GEOLOGIST KE Miller
 CREW MEMBER(S) DOUG SCHROER
 SUBCONTRACTOR(S) JIM VOORHIES (URIE ENV.)
GREG GALLEGOS (JENNISON CONST)
 TOTAL DEPTH (FT) 45 BORING DIAMETER (IN) 7 1/4
 DEPTH TO BEDROCK (FT) / WATER LEVEL (FT) /
 AUGERS & BIT TYPE & LD (IN) 14SAs 3 1/4
 DECONTAMINATION All drill equipment decontaminated at RFP decon pad

SAMPLE NUMBERS TYPES AND DEPTHS (FT)

SAMPLE #	TYPE	DEPTH	SAMPLE #	TYPE	DEPTH	SAMPLE #	TYPE	DEPTH
BH10027WS	S + MIB	225-45						
Bit 10028WS	VOC	/						
Bit 10029WS	BNA	/						

HAMMER SIZE (LB) _____

END OF DAY STATUS (CHECK 1) In Progress _____ Drilling Completed ☒

CHRONOLOGICAL RECORD OF ACTIVITIES (AND COMMENTS)

0935 - begin drilling
0950 cease drilling due to carbon jet hit augers and
on cuttings
1120 - Complete hole @ 45', will abandon with no further
act to

COMPLETED BY Kenneth Miller  8/28/92
Print Name Signature Date
 SUBCONTRACTOR WESTON

BOREHOLE ABANDONMENT
FIELD ACTIVITIES REPORT

PROJECT NAME	<u>1HSS 119 1</u>	
BOREHOLE IDENTIFICATION	<u>FT00692</u>	DATE <u>8/28/92</u>
WEATHER CONDITIONS	<u>70's F, clear, wind from the east</u>	
RIG TYPE	<u>B 61 Mob / Dr 11</u>	
DRILLER & DRILLING COMPANY	<u>Roger Sharp Boyles Bros</u>	
GEOLOGIST	<u>KE Miller</u>	
CREW MEMBER(S)	<u>Doug Schroer</u>	
SUBCONTRACTOR(S)	<u>Jim Voorhies - Urie Env</u>	
	<u>Greg Gallegas - Jenn son Const</u>	
TOTAL DEPTH (FT)	<u>45</u>	BORING DIAMETER (IN) <u>7 1/4</u>
WATER LEVEL (FT)	<u>/</u>	
TREMIE & PUMPING EQUIPMENT	<u>1" Steel pipe chem grout mixer</u>	
GROUT VOLUME PLACED (FT³)	<u>≈ 15 cu/ft</u>	
CASING REMOVED	<u>/</u>	
Type/Length (Ft)/Diameter (In)	<u>/</u>	
CASING LEFT IN PLACE	<u>/</u>	
Type/Length (Ft)/Diameter (In)	<u>/</u>	
SURFACE SEAL	Date Set <u>8/28/92</u>	Depth (Ft) <u>45'</u>
CHRONOLOGICAL RECORD OF ACTIVITIES (AND COMMENTS)		
<u>1220- began grouting hole</u>		
<u>1350- grouting complete</u>		
<u> </u>		
<u> </u>		
<u> </u>		
<u> </u>		
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<u> </u>		
COMPLETED BY	<u>Kenneth Miller</u>	<u>8/28/92</u>
	<small>Print Name</small>	<small>Date</small>
SUBCONTRACTOR	<u>WESTON</u>	

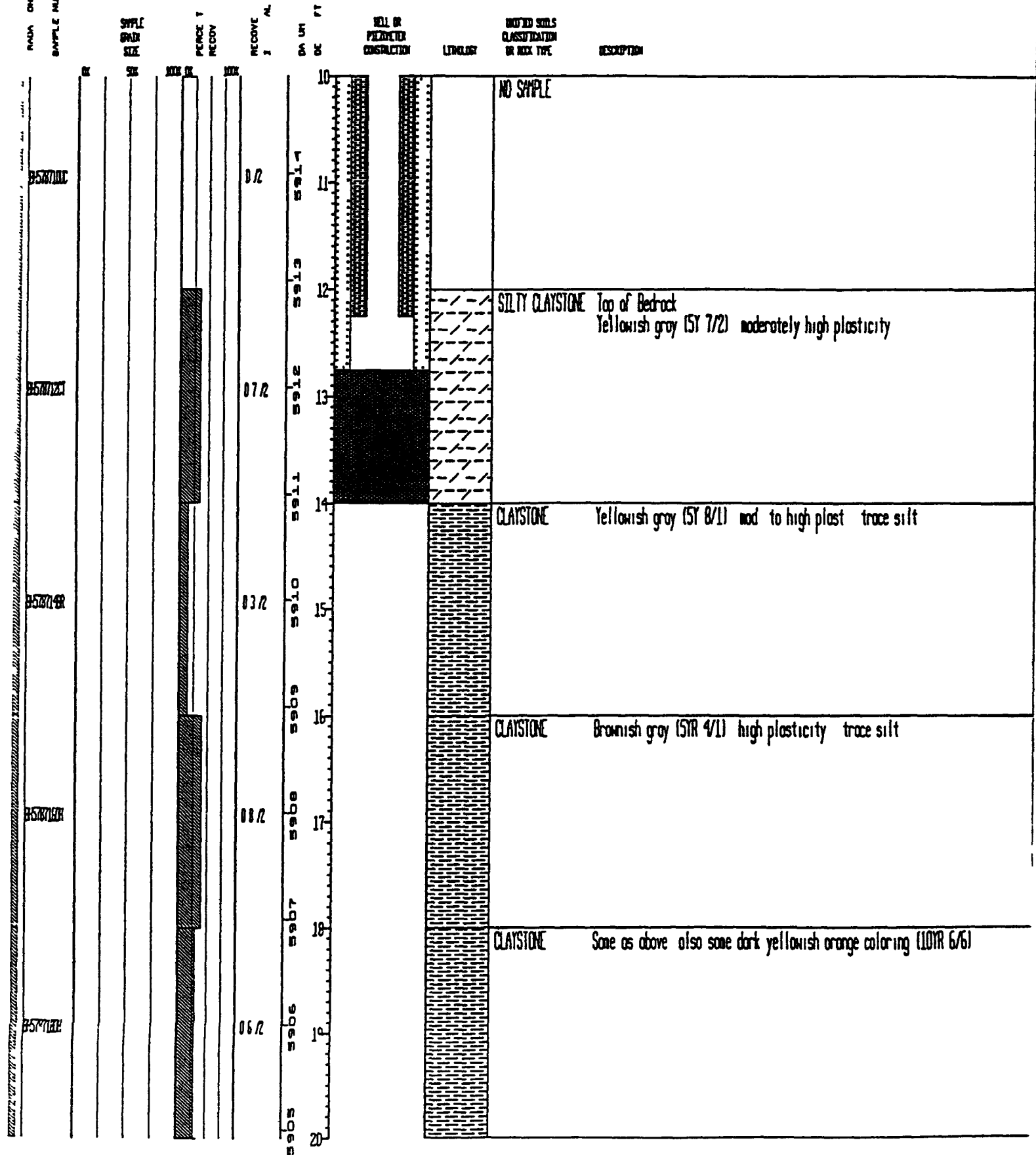
43-87

Hollow Stem Auger Lower section of borehole from 14 0' to 32 0' was backfilled w/ Portland Type I cement on Oct 9 1987 and allowed to solidify



STATE PLANE COORDINATE	TOTAL DEPTH (FT) 32	GROUND ELEVATION (FT) 5924.92	PROJECT NUMBER 667 11	LOG OF BOREHOLE NUMBER
NORTH 749029	AREA 881 HILLSIDE	CASING DIAMETER (IN) 2 ID	GEOLOGIST LAM	43-87
EAST 2084788	LOCATOR NUMBER LB	BOREHOLE DIAMETER (IN) 7.5	DATE DRILLED 10/09/87	

REMARKS Boring No 43-87/B-51-87
Hollow Stem Auger Lower section of borehole from 14.0 to 32.0' was backfilled w/ Portland Type I cement on Oct. 9, 1987 and allowed to solidify



Well	Depth (ft)	Date Measured
4387	10 08	03 Jan. 92
4387	9 89	13 Feb 92
4387	10 18	05 Mar 92
4387	7 90	01 Apr 92
4387	8 92	05 May 92
4387	8 67	01 Jun. 92
4387	9 27	23 Jun. 92
4387	9 20	02 Jul. 92
4387	9 17	03 Aug 92
4387	9 08	06 Aug. 92
4387	8 95	04 Sep 92



International
Technology
Corporation

Olga Erlich
EG&G Rocky Flats Inc
P O Box 464
Golden Colorado
80402-0464

October 19 1992

Dear Olga Erlich

**ROCKY FLATS HILLSIDE 881 SOIL FLUSHING TREATABILITY STUDY
INITIAL CHARACTERIZATION SUMMARY REPORT**

Soil and water samples from Rocky Flats were received by IT's Pollution Control Engineering (PCE) group at IT's Special Analytical Laboratory (SAL) between August 28 and September 3 1992. The soil samples were maintained at 4°C while at the SAL. Soil samples BH10006WS BH10007WS BH10008WS BH10018WS and a spiked sample were initially analyzed for volatile organic compounds (VOCs) at the SAL on September 4. Four grams of soil were extracted with methanol at a 1:1 (wt:wt) ratio and 200 µL injected into a purge and trap apparatus containing 20 mL UV DI H₂O. Gas chromatography was used to detect the presence of volatile organics. No compounds other than the spike were detected.

Specific soil samples were then directly heated and purged at 80° to 100°C. The purpose of this initial analytical procedure was to provide a gross qualification as to the presence of any VOCs in the Hillside 881 soils. The following is a list of these samples noting sample number container type sample weight and approximate total VOC concentration.

BH10018WS	tube	14.8g	2.6 µg/kg
BH10015WS	tube	16.5g	12.5 µg/kg
BH10017WS	tube	18.3g	2.8 µg/kg
BH10022WS	tube	19.6g	5.4 µg/kg
BH10023WS	tube	18.4g	8.9 µg/kg
BH10027WS	tube	15.7g	18.3 µg/kg
BH10010WS	tube	23.2g	1.6 µg/kg
BH10009WS	tube	25.3g	1.9 µg/kg
BH10017WS	bag	18.8g	3.5 µg/kg
BH10018WS	bag	20.3g	4.7 µg/kg
BH10006WS	bag	18.2g	11.5 µg/kg
BH10007WS	bag	17.4g	25.8 µg/kg
BH10019WS	tube	25.3g	1.0 µg/kg
BH10009WS	bag	18.5g	4.8 µg/kg
BH10016WS	bag	21.6g	27.6 µg/kg
BH10019WS	bag	15.9g	19.9 µg/kg

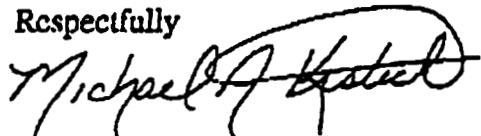
Based on these results, selected soil samples were proposed for use in the batch equilibrium and soil flushing treatability study. The soil samples selected were BH10007WS BH10015WS BH10016WS BH10017WS BH10022WS and BH10023WS. Representative aliquots of each soil were taken and sent to IT's Middlebrook Laboratory on September 22 and 25 for a baseline VOC characterization. Results from these analyses, contained in the attachment, were received back on October 7 and 12. These results indicate that the only VOC detected above the detection limit was tetrachloroethene and in all samples less than or equal to 30 µg/kg.

These results indicate that although RCRA VOCs are present in Hillside 881 soils selected samples received by the SAL do not contain high enough concentrations of these compounds to allow for a desorption or flushing study to be conducted as initially scoped in the proposal. After internally reviewing the situation we recommend the following options

- 1 Resample Hillside 881 At the same time conduct a more intensive quality control check of all samples retrieved for the treatability study to ensure that soils contain sufficient levels of VOCs
- 2 Replace the batch equilibrium desorption study with an adsorption study in support of the fate and transport model The physical chemistry of the system, including kinetics and other reaction characteristics could provide the necessary information as to the affinity and binding mechanisms of organic compounds with the selected soils from Hillside 881
- 3 A soil flushing study could be conducted, however soil from the site would have to be spiked prior to use in the treatability study This requires that only remolded soil could be used in the flushing study It also requires that a designated time period be allocated for allowing the organic compounds and soil to reach an equilibrium prior to initiating the flushing study Internal research and development data generated during 1991 using this system and VOCs would be used to provide the basis for this type of study
- 4 The final option is to conduct no treatability study This must be evaluated by EG&G based on the recommendations of DOE and EPA

Should you have any questions please call me

Respectfully



Michael A. Krüch Ph D

Attachments Certificates of Analysis

IT Corporation
October 7 1992

IT ANALYTICAL SERVICES
5815 MIDDLEBROOK PIKE
KNOXVILLE TN

Client Project ID Rocky Flats

Job Number ITED 52418

VOLATILE ORGANIC TARGET COMPOUND LIST

Results in $\mu\text{g/kg}$ (ppb) dry weight

Sample Matrix: Soil

Client Sample ID: Lot 7-GG5423
Lab Sample ID TT7059

<u>Compound</u>	<u>Concentration</u>	<u>Compound</u>	<u>Concentration</u>
chloromethane	12 U	1 2-dichloropropane	6 U
bromomethane	12 U	cis-1,3-dichloropropene	6 U
vinyl chloride	12 U	trichloroethene	6 U
chloroethane	12 U	dibromochloromethane	6 U
methylene chloride	8 B	1 1 2-trichloroethane	6 U
acetone	12 U	benzene	6 U
carbon disulfide	6 U	trans-1 3-dichloropropene	6 U
1 1-dichloroethene	6 U	bromoform	6 U
1 1-dichloroethane	6 U	4-methyl 2-pentanone	12 U
1 2-dichloroethene (total)	6 U	2-hexanone	12 U
chloroform	2 J	tetrachloroethene	15
1 2-dichloroethane	6 U	1 1 2 2-tetrachloroethane	6 U
2-butanone	12 U	toluene	6 U
1 1 1-trichloroethane	6 U	chlorobenzene	6 U
carbon tetrachloride	6 U	ethylbenzene	6 U
vinyl acetate	12 U	styrene	6 U
bromodichloromethane	6 U	xylene (total)	6 U

U Compound was analyzed for but not detected. The number is the detection limit for the sample.
J Indicates an estimated value less than the detection limit.
B Analyte was found in the blank as well as the sample.

Date of Analysis 09/30/92
Dilution Factor 10
% Moisture 18

IT Corporation
October 7, 1992

IT ANALYTICAL SERVICES
5815 MIDDLEBROOK PIKE
KNOXVILLE TN

Client Project ID Rocky Flats

Job Number ITED 52418

VOLATILE ORGANIC TARGET COMPOUND LIST

Results in $\mu\text{g/kg}$ (ppb) dry weight

Sample Matrix: Soil

Client Sample ID Lot 15-GG5436
Lab Sample ID TT7060

<u>Compound</u>	<u>Concentration</u>	<u>Compound</u>	<u>Concentration</u>
chloromethane	12 U	1,2-dichloropropane	6 U
bromomethane	12 U	cis-1 3-dichloropropene	6 U
vinyl chloride	12 U	trichloroethane	6 U
chloroethane	12 U	dibromochloromethane	6 U
methylene chloride	9 B	1 1,2-trichloroethane	6 U
acetone	14	benzene	6 U
carbon disulfide	5 J	trans 1 3-dichloropropene	6 U
1 1-dichloroethene	6 U	bromoform	6 U
1 1-dichloroethane	6 U	4-methyl 2-pentanone	12 U
1 2-dichloroethene (total)	6 U	2-hexanone	12 U
chloroform	2 J	tetrachloroethene	8
1 2-dichloroethane	6 U	1 1 2 2-tetrachloroethane	6 U
2-butanone	12 U	toluene	4 J
1 1 1 trichloroethane	6 U	chlorobenzene	6 U
carbon tetrachloride	2 J	ethylbenzene	6 U
vinyl acetate	12 U	styrene	6 U
bromodichloromethane	6 U	xylenes (total)	1 J

U Compound was analyzed for but not detected. The number is the detection limit for the sample.
J Indicates an estimated value less than the detection limit.
B Analyte was found in the blank as well as the sample

Date of Analysis: 09/30/92
Dilution Factor 10
% Moisture 15

IT Corporation
October 7, 1992

IT ANALYTICAL SERVICES
5815 MIDDLEBROOK PIKE
KNOXVILLE TN

Client Project ID Rocky Flats

Job Number ITED 52418

VOLATILE ORGANIC TARGET COMPOUND LIST

Results in $\mu\text{g/kg}$ (ppb) dry weight

Sample Matrix: Soil

Client Sample ID Lot 16-GG5432

Lab Sample ID TT7061

<u>Compound</u>	<u>Concentration</u>	<u>Compound</u>	<u>Concentration</u>
chloromethane	12 U	1,2-dichloropropane	6 U
bromomethane	12 U	cis-1 3-dichloropropane	6 U
vinyl chloride	12 U	trichloroethane	6 U
chloroethane	12 U	dibromochloromethane	6 U
methylene chloride	7 B	1 1 2-trichloroethane	6 U
acetone	12 U	benzene	6 U
carbon disulfide	6 U	trans-1,3-dichloropropane	6 U
1 1-dichloroethane	6 U	bromoform	6 U
1 1-dichloroethane	6 U	4-methyl 2-pentanone	12 U
1 2-dichloroethane (total)	6 U	2-hexanone	12 U
chloroform	2 J	tetrachloroethane	30
1 2-dichloroethane	6 U	1 1 2 2-tetrachloroethane	6 U
2-butanone	12 U	toluene	6 U
1 1 1 trichloroethane	6 U	chlorobenzene	6 U
carbon tetrachloride	6 U	ethylbenzene	6 U
vinyl acetate	12 U	styrene	6 U
bromodichloromethane	6 U	xylenes (total)	6 U

U Compound was analyzed for but not detected. The number is the detection limit for the sample.
J Indicates an estimated value less than the detection limit.
B Analyte was found in the blank as well as the sample

Date of Analysis 09/30/92
Dilution Factor 10
% Moisture 16

IT Corporation
October 7 1992

IT ANALYTICAL SERVICES
5815 MIDDLEBROOK PIKE
KNOXVILLE TN

Client Project ID Rocky Flats

Job Number ITED 52418

VOLATILE ORGANIC TARGET COMPOUND LIST

Results in $\mu\text{g/kg}$ (ppb) dry weight
Sample Matrix: Soil

Client Sample ID Lot 17-GG5434
Lab Sample ID TT7062

<u>Compound</u>	<u>Concentration</u>	<u>Compound</u>	<u>Concentration</u>
chloromethane	11 U	1,2-dichloropropane	6 U
bromomethane	11 U	cis-1,3-dichloropropene	6 U
vinyl chloride	11 U	trichloroethene	6 U
chloroethane	11 U	dibromochloromethane	6 U
methylene chloride	17 B	1 1 2 trichloroethane	6 U
acetone	68	benzene	6 U
carbon disulfide	6 U	trans-1,3-dichloropropene	6 U
1 1-dichloroethane	6 U	bromoform	6 U
1 1-dichloroethane	6 U	4-methyl 2 pentanone	11 U
1 2-dichloroethene (total)	6 U	2-hexanone	11 U
chloroform	2 J	tetrachloroethene	6 U
1,2-dichloroethane	6 U	1 1,2 2-tetrachloroethane	6 U
2-butanone	11 U	toluene	6 U
1 1 1 trichloroethane	6 U	chlorobenzene	6 U
carbon tetrachloride	6 U	ethylbenzene	6 U
vinyl acetate	11 U	styrene	6 U
bromodichloromethane	6 U	xylenes (total)	6 U

U Compound was analyzed for but not detected The number is the detection limit for the sample
J Indicates an estimated value less than the detection limit.
B Analyte was found in the blank as well as the sample

Date of Analysis 09/30/92
Dilution Factor 10
% Moisture 12

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

GG5448

Dm 8
11/12-92

Lab Name: ITAS-KNOXVILLE Contract: _____

Lab Code: ITSTU Case No 52719 SAS No : _____ SDG NO : GG5449

Matrix: (soil/water) SOIL Lab Sample ID: W2161

Sample wt/vol: 5.0 (g/mL) G Lab File ID: W2161

Level: (low/had) LOW Date Received: 11/03/92

Moisture not dec. 14 Date Analysed: 11/06/92

Column: (pack/cap) CAP Dilution Factor: 1 0

CAS NO	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) <u>UG/KG</u>	Q
74-87-3	Chloromethane	12	
74-83-9	Bromomethane	12	
75-01-4	Vinyl Chloride	12	
75-00-3	Chloroethane	12	
75-09-2	Methylene Chloride	11	
67-64-1	Acetone	3 12	
75-15-0	Carbon Disulfide	6	
75-35-4	1,1-Dichloroethene	6	
75-34-3	1,1-Dichloroethane	6	
540-59-0	1,2-Dichloroethane (total)	6	
67-66-3	Chloroform	6	
107-06-2	1,2-Dichloroethane	6	
78-93-3	2-Butanone	12	
71-55-6	1,1,1-Trichloroethane	6	
56-23-5	Carbon Tetrachloride	6	
108-05-4	Vinyl Acetate	12	
75-27-4	Bromodichloromethane	6	
78-87-5	1,3-Dichloropropane	6	
10051-01-5	cis-1,3-Dichloropropene	6	
79-01-6	Trichloroethene	6	
124-48-1	Dibromochloromethane	6	
79-00-5	1,1,2-Trichloroethane	6	
71-43-2	Benzene	6	
10051-02-6	trans-1,3-Dichloropropene	6	
75-25-2	Bromoform	6	
108-10-1	4-Methyl-2-Pentanone	12	
591-78-6	2-Hexanone	12	
127-18-4	Tetrachloroethene	6	
79-34-5	1,1,2,2-Tetrachloroethane	6	
108-88-3	Toluene	2	
108-90-7	Chlorobenzene	6	

2nd
11-11-92

94c 578

Dm 8
11/12-92

W/10

11 13 92

EPA SAMPLE NO.

13
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

GG5449

Lab # ITAS-KNOXVILLE Contract: _____

Lab # ITSTU Case No 52712 SAS No : _____ SDG No : GG5449

Mat: (soil/water) SOIL Lab Sample ID W2161

Sampl wt/vol: 30.0 (g/mL) g Lab File ID: W2161

Level (low/med) LOW Date Received: 11/03/92

Mc ure not dec 14 dec _____ Date Extracted 11/04/92

Extr ions: (sepF/Cont/None) SONC Date Analysed: 11/09/92

GPC anup. (Y/N) N pH: _____ Dilution Factor 2.0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NO	COMPOUND		
108-95-2	Phenol	770	U
111-44-4	bis(2-Chloroethyl) Ether	770	U
95-57-8	2-Chlorophenol	770	U
541-73-1	1,3-Dichlorobenzene	770	U
106-46-7	1,4-Dichlorobenzene	770	U
100-51-6	Benzyl Alcohol	770	U
95-50-1	1,2-Dichlorobenzene	770	U
95-48-7	2-Methylphenol	770	U
108-80-1	bis(2-Chloroisopropyl) Ether	770	U
106-44-5	4-Methylphenol	770	U
621-64-7	N-Nitroso-Di-n-Propylamine	770	U
67-72-1	Hexachloroethane	770	U
98-95-3	Nitrobenzene	770	U
78-89-1	Isophorone	770	U
88-75-5	2-Nitrophenol	770	U
105-67-9	2,4-Dimethylphenol	770	U
68-85-0	Succinic Acid	3700	U
111-91-1	bis(2-Chloroethoxy) Methane	770	U
130-83-2	2,4-Dichlorophenol	770	U
120-82-1	1,2,4-Trichlorobenzene	770	U
91-20-3	Naphthalene	770	U
106-47-8	4-Chloroaniline	770	U
87-68-3	Hexachlorobutadiene	770	U
59-50-7	4-Chloro-3-Methylphenol	770	U
91-57-6	2-Methylnaphthalene	770	U
77-47-4	Hexachlorocyclopentadiene	770	U
88-06-2	2,4,6-Trichlorophenol	770	U
95-95-4	2,4,5-Trichlorophenol	3700	U
91-58-7	2-Chloronaphthalene	770	U
88-74-4	3-Nitroaniline	3700	U
131-11-3	Dimethyl Phthalate	770	U
208-95-8	Acenaphthylene	770	U
606-20-2	2,6-Dinitrotoluene	770	U

FORM I SV-1

1/87 Rev

u =

1C
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO

GG5449

Lab e: ITAS-KNOXVILLE Contract: _____
Lab e: ITSTU Case No: E1719 SAS No: _____ SDC No: GG5449
Mat: (soil/water) SOIL Lab Sample ID: W2161
Samp wt/vol: 10.0 (g/mL) G Lab File ID: W2161
Leve (low/med) LOW Date Received: 11/03/92
t Mo ture not dec 14 dec _____ Date Extracted: 11/04/92
Extr tion: (SapF/Cont/Sono) NONC Date Analysed: 11/09/92
GPC manip: Y/W N PH: _____ Dilution Factor: 2 0

CAS NO	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) <u>UG/KG</u>	Q
99-09-2	3-Nitroaniline	1700	U
83-32-9	Acenaphthene	770	U
51-28-5	2,4-Dinitrophenol	1700	U
100-02-7	4-Nitrophenol	1700	U
132-84-9	Dibenzofuran	770	U
121-14-2	2,4-Dinitrotoluene	770	U
84-66-2	Diethylphthalate	770	U
7005-72-1	4-Chlorophenyl-phenylether	770	U
86-73-7	Fluorene	770	U
100-01-6	4-Nitroaniline	1700	U
534-82-1	4,6-Dinitro-2-Methylphenol	1700	U
86-30-6	N-Nitrosodiphenylamine (1)	770	U
101-55-3	4-Bromophenyl-phenylether	770	U
118-74-1	Hexachlorobenzene	770	U
87-86-5	Pentachlorophenol	1700	U
85-01-8	Phenanthrene	770	U
120-12-7	Anthracene	770	U
84-74-2	Di-n-Butylphthalate	770	U
206-44-0	Fluoranthene	770	U
119-00-0	Pyrene	770	U
85-68-7	Butylbenzylphthalate	770	U
91-94-1	3,3'-Dichlorobenzidine	1500	U
56-55-3	Benzo(a)Anthracene	770	U
218-01-9	Chrysene	770	U
117-81-7	bis(2-Ethylhexyl) Phthalate	770	U
117-84-0	Di-n-Octyl Phthalate	770	U
205-99-2	Benzo(b)Fluoranthene	770	U
207-08-9	Benzo(k)Fluoranthene	770	U
50-32-8	Benzo(a)Pyrene	770	U
193-19-3	Indeno(1,2,3-cd)Pyrene	770	U
53-70-1	Dibenz(a,h)Anthracene	770	U
191-24-2	Benzo(g,h,i)Perylene	770	U

1) - Cannot be separated from Diphenylamine

U=